Resource Management in the State of Delaware

Report to the Secretary
Delaware Natural Resources and Environmental Control
Dover, Delaware

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Washington, DC

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Acknowledgements

The Institute for Local Self-Reliance (ILSR) is a 33 year-old non-profit research and technical assistance organization focusing on sustainable resource and economic development, with offices in Washington, DC and Minneapolis, MN. The Delaware Department of Natural Resources and Environmental Control (DNREC) contracted with ILSR to provide a third party analysis and recommendations on how to manage resources currently disposed in landfills in Delaware.

Principal authors of this report, Neil Seldman and Richard Anthony.

ILSR acknowledges the cooperation of Delaware State and local officials, business representatives from across industrial sectors, educators, and civic and environmentally involved citizens. This cooperation from each corner of the state allowed us to gather information quickly and obtain frank and direct feedback, which contributed to the analysis and recommendations in this report.

The views in the report remain those of the authors and do not necessarily reflect those of the individuals interviewed during the research phase leading to this report.

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Table of Contents

I. Executive Summary and Recommendations

Significant opportunities exist to reduce overall costs and generate net revenue and create jobs by reforming the state solid waste management system into a state resource management system. No insurmountable barriers exist, and the opportunities for converting waste liabilities into recycling resource assets require only a shift in current incentives and business models. Delaware can successfully adopt business models from other states and expand business models within the state to substantially increase recycling, with an overall reduction in costs to state government and taxpayers, residents and businesses alike. This report recommends future actions to be discussed with stakeholders at public forums. The Institute for Local Self-Reliance (ILSR) interviewed 85 stakeholders during the preparation of this report, which was intended to help serve as the basis for future public dialogue. Forty stakeholders participated in public forums held to discuss the report from 6-13 June 2007 in Wilmington, New Castle, Dover and Rehoboth Beach. These forums provided feedback, which is summarized in Appendix F.

Recommendations

- Enact a surcharge of $6 per ton on solid waste landfilled in the state for six years to raise approximately $20 million for investment.
- Institute a grant program to stimulate additional municipal and private sector recycling to be administered by the Department of Natural Resources & Environmental Control (DNREC) with input from citizen/business advisory committee.
- Consider required separation for households, businesses and office buildings in year five of the program.

Discussion

ILSR concludes that an investment by the State of just under $20 million will pay significant dividends ranging from $390 to $585 million over the six year period of the recommended program.

An estimated 1 million tons[1] of resources are disposed at landfills in Delaware each year. ILSR analyzed existing data using a market characterization of the discard stream. Based on one scenario of material value, findings indicate that as many as 1,574 jobs could be created and $40 million in annual gross revenue could be gained from sale of materials at the 50% recycling and composting (including mulching) level. At a 75% recycling and composting level, the number of

[1] Actual tonnage figures for materials delivered to Delaware landfills in 2006 were 1,175,306 tons. See, Elko & Associates, *Comprehensive Annual Financial Report: Fiscal Years Ended June 30, 2006 and 2005*, Delaware Solid Waste Authority; and DSM Environmental Services, *State of Delaware Assessment of Commercial and Industrial Recycling Activity, Delaware Solid Waste Authority*, July 2006. http://www.dswa.com/pdfs/DSMreport.pdf

jobs could increase to 2,360 jobs and materials revenues to $60 million. At the same time, households, local government and businesses could avoid $25 million annually in disposal fees if 50% recycling composting levels were reached. Avoid disposal fees could climb to $35.5 million if the State reached a 75% recycling and composting level. ILSR concludes that a $20 million investment over a six-year period can provide the necessary infrastructures for recycling and composting to reach the 50% and 75% levels. This investment should focus on public awareness and education, management training, financial incentives for public and private haulers and processors, and a phased-in requirement to separate materials at the source of generation. A $6 per ton surcharge on materials landfilled would provide grant funding for infrastructure programs. The surcharge could sunset after the sixth year.

In addition to financial savings, high levels of recycling and composting would extend the state's landfill capacity for additional decades. Further, such high levels of recycling and composting would reduce greenhouse gas emissions entering the atmosphere (directly from landfills and indirectly by reducing virgin material impacts), as well as reduce energy, water, and raw material usage.

The current "Recycle Delaware" igloo drop-off system, operated by the Delaware Solid Waste Authority (DSWA), needs to be complemented by drop-off service at many more sources of generation and at disposal facilities. Further, the drop-off system needs to be complemented with curbside services. Curbside collection is needed to capture a larger portion of recyclable and compostable material. While residential curbside recycling service is currently available to single family homes, this service reaches only one-sixth of the population of the state. Further, little or no effort has been placed on servicing multi-family dwellings. New techniques such as single stream, every other week collection offer significant cost-cutting opportunities[2]. With the introduction of expanded curbside collection, existing drop-off sites can be reconfigured. The public and industry need more opportunities to keep materials separate in single-stream or multi-stream collection programs. A grant program funded by a surcharge on materials landfilled has the potential to enhance and accelerate public and private processing and marketing, public awareness, management and labor training, unified public education, and funding for equipment, which are all required to reach high levels of landfill diversion. This program will allow the state to reach the current goal of 51% diversion from landfill through recycling and composting (a goal established by Governor Minner). Once infrastructure investments are made through the surcharge-grant program and recycling and composting services are widely available, policies requiring businesses and residents to recycle and compost will be politically acceptable. Mandates will help the state reach the highest levels of diversion possible.

The six-year surcharge will raise an estimated $20 million. Local jurisdictions and businesses that can draw on these funds to help recover their resources for markets and divert them from state landfills will realize windfall savings from avoided disposal fees. In addition to funds available from the surcharge program, private and public investment at the local level will sustain high levels of recycling after the six-year funding program sunsets.

Discussions with managers of DSWA indicated that they support a phased-in requirement for separation and a surcharge as part of a sustainable resource management system. DSWA

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[2] See," Delaware Recycling Program Faces Shake Up", Delaware News Journal, 28 August 2007, at http://www.recyclingtoday.com/News/news.asp?ld=11855.

currently offers limited curbside collection for recyclable and compostable materials as part of its services. DSWA's enhanced curbside recycling efforts in cooperation with local governments are expected to increase materials sales revenue to DSWA. Market income from material sales in 2006 was $2,287,844; up from $1,558,363 in 2005, and $1,229,492 in 2004.[3]

ILSR proposes that the state environmental agency, the Department of Natural Resources and Environmental Control (DNREC) administer the surcharge grants program and take responsibility for public awareness and education. DNREC could oversee funding the establishment of training programs, including those at public and private colleges and universities in the state. It could also provide oversight of grants to local agencies for managing these programs. The grant program should be entirely transparent and accountable, with a citizen/business advisory committee making recommendations about criteria for awarding grants. ILSR recommends that the awards be made on the basis of merit and effectiveness, with criteria that favor job creation, keeping materials circulating within the state and regional economy, making final products within Delaware and that support of small business.

ILSR concludes that the future environmental and economic health of the state requires a transition to resource management that will expand private enterprise, reduce energy inputs and global warming impacts, and provide discard management capacity as the state moves along the path toward zero waste.[4]

II. Purpose of the Resource Management Report

A. Background

The Delaware Department of Natural Resources and Environmental Control (DNREC) commissioned the Institute for Local Self-Reliance (ILSR) to freshly examine and analyze Delaware's current solid waste system, to recommend how the State can increase waste reduction, recycling and composting; and, therefore, decrease the flow of materials to the state's landfills.

The scope of work calls for ILSR to engage stakeholders in dialogue, to listen carefully and make recommendations for state policy based on existing models with which ILSR is familiar elsewhere in the USA.[5] **Appendix A, Stakeholder Contact List**, includes the names of people contacted for this report.

The resource management approach is based on keeping materials segregated into selected categories. This allows for cost-effective reuse, recycling, and composting.

According to the US Environmental Protection Agency (EPA), recycling is one of the most effective ways for households, communities and businesses to reduce greenhouse gas emissions.

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[3] See, Comprehensive Annual Financial Report: 2006 and 2005, op. cit.

[4] See, "Zero Waste Business Principles," Grass Roots Recycling Network web page, www.grrn.org

[5] See for instance, ILSR, *Cutting the Waste Stream in Half: Community Record Setters Show How*, USEPA, EPA-530-F-99-017, October l999, available at www.epa.gov/osw.

When fewer materials are landfilled, production of total methane – a potent greenhouse gas – decreases. Landfills are the number one source of man-made methane emissions in the United States. Keeping organic matter out of landfills is one key strategy for reducing landfill methane emissions. Composting organic matter reduces methane generation and sequesters carbon.

Recycling can also help sequester carbon in order to reduce greenhouse gases. When paper products are recycled, fewer trees are cleared from forests and tree farms. These standing trees capture and absorb carbon dioxide, another greenhouse gas. Creating new products from recycled materials requires less energy than making the same products from virgin materials. By decreasing energy use, industry burns fewer fossil fuels and lowers greenhouse gas emissions from power plants. According to the US EPA, reducing one person's garbage by 25% will reduce carbon dioxide emissions by 1,000 pounds per year. Recycling aluminum cans, glass bottles, plastics, cardboard and newspapers can reduce one household's impact by 850 pounds of carbon dioxide per year. Decreasing carbon dioxide emissions will help stop global warming.[6]

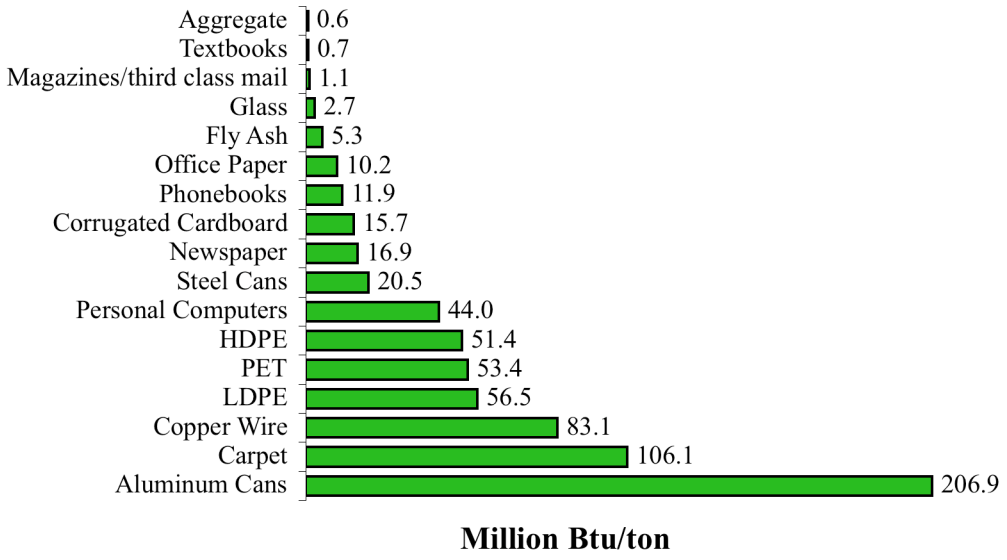
Most recently, CEOs of ten of the country's top corporations appealed to the US government to adopt policies that alleviate the impacts of global warming. Charles 'Chad' O. Holliday, Jr., CEO of Dupont Corporation called for a crackdown on climate change. "Voluntary efforts (by forward-thinking corporations) alone will not solve the problem," Holliday told the US Senate. "We need sound policy that takes broad, coordinated action across the entire country."[7] Holliday was speaking both for the E. I. Du Pont, Inc. as well as the US Climate Action Partnership.

Figure 1 shows the dramatic energy savings from recycling. In addition to energy savings in industry, the environmental benefits of recycling include reduced water usage, air pollution, water pollution and mining wastes. See Table 1.

[6] See US EPA climate change website (www.epa.gov/climatechange).

[7] Philadelphia Inquirer, 15 February 2007. Also see *Report of the UN Intragovernmental Panel on Climate Change*, reported in the New York Times, 10 April 2007.

Figure 1: Energy Savings Per Ton Recycled



Source: Jeffrey Morris, "Recycling versus Incineration: An Energy Conservation Analysis," *Journal of Hazardous Materials*, # 47, 1996

Table 1: Environmental Benefits of Recycling

	Aluminum	Steel	Paper	Glass
Energy Use	90-97%	47-74%	23-74%	4-32%
Air Pollution	95%	85%	74%	20%
Water Pollution	97%	76%	35%	---
Mining Wastes	---	97%	---	80%
Water Use	---	40%	58%	50%

Source: Robert Cowles Lechter and Mary T. Sheil, "Source Separation and Citizen Recycling," in William D. Robinson, Ed. *The Solid Waste Handbook*, John Wiley & Sons, New York, l986.

At the same time, the resource management approach supports the economic goals of new jobs, small businesses and an expanding tax base for the state and its jurisdictions.
Finally, the resource management approach is consistent with the top priority for Delaware identified in the Solid Waste Management Alternatives for Delaware Report by the Solid Waste Management Technical Working Group: the cost effective preservation of the state's valuable landfill capacity.[8]

Kick-Off Meeting: the project kick-off meeting was held in November 2006 in Dover with DNREC Secretary John Hughes, Governor Minner's Environmental Advisor Lee Ann Walling,

[8] Solid Waste Management Technical Working Group, May 15, 2006.

DNREC Director of Air and Waste Management, James Werner and staff members James Short and Nancy Marker and ILSR researchers Neil Seldman and Richard Anthony.

The meeting focused on current solid waste management issues and the need for an independent study based on a review of planning documents and on meetings with stakeholders. Issues discussed were:

- Recycling availability;
- Recycling convenience;
- Recycling infrastructure including planning, training and financing; and
- Yard waste composting/mulch infrastructure.

It was agreed that after ILSR interviewed stakeholders, their input would be used to prepare a presentation on a new approach to solid waste management in Delaware. The presentation will include relevant waste reduction models from throughout the US to facilitate stakeholders' discussion on alternative resource management options for Delaware.

Review of Documents: ILSR reviewed numerous documents concerning solid waste management in Delaware prepared by DNREC, DSWA and a variety of consulting companies dating from 2004 through 2006. ILSR gleaned from these reports important data and the dominant approach to solid waste management up to this time. *See Appendix E.*

Stakeholder Interviews *(See Appendix B)***:** Individual and group meetings were held throughout the state from November 2006 through January 2007. These included the December meeting of the Delaware Nursery and Landscape Association in Hockessin, and a meeting with local government officials, state representatives, and the League of Women Voters at the Limestone Presbyterian Church, Wilmington, as well as individual meetings with educators, recycling and composting companies, end use markets and materials brokers, general industry representatives, civic association representatives, local solid waste managers, town managers, state agency representatives (including planners and management technicians at Delaware Solid Waste Authority landfill), recycling and composting facility operators, and members of the Recycling Public Advisory Committee (RPAC) recreated by Governor Minner through Executive Order Ninety (dated September 2006).

Public meetings: Upon completion of research and preparation of a Resource Management Report, ILSR will present the report at public meetings for public discussion. The meetings will be mutually determined with DNREC.

The purpose of these meetings is to present findings and rationale for policy recommendations to a wide variety of stakeholders in order to get feedback on the concepts and details in the report.

These meetings and dialogues with stakeholders will be summarized and submitted to DNREC.

B. Current Infrastructure

Capacity: For the purpose of this report, ILSR assumed that one million tons of materials per year are disposed in Delaware landfills[9].

Figure 2 shows the categories and percentages of resources currently being buried in Delaware landfills.

The pie chart in Figure 2 shows how Delaware discards can be sorted into market categories. All the discards can be sorted in 12 groups. Most of the categories are self-evident. Polymers include plastic and rubber materials. Ceramics are materials that are inert and brittle like rocks and stones. Reuse covers all categories and includes products that can be repaired, reused and dismantled for recycling in the other groups. Note that half of the materials are soils, yard debris, putrescibles and soiled paper that are quality inputs into a composting system if they are kept separate from other materials and collected without contamination. Putrescibles are organics that rot at a fast rate such as food.

These materials are quality inputs to compost when they are separated at the source of generation. In response to yard debris bans in 23 states in the US, collecting, processing and marketing this material has been achieved cost effectively.

In Delaware where poultry management is a key industry, source separated yard debris is an essential ingredient in the best management practices for handling chicken breeding discards. Two tons of shredded yard debris is needed to properly compost one ton of dead chickens.

There is a large potential for the collection of compostable materials (food, yard debris, and food-soiled paper) the market for mulch and compost products is in Delaware. The market for these materials generated in Delaware is in Delaware. At this time much of the compost used in the State of Delaware is imported from other areas. The Delaware nursery and landscape industry and grounds management industry require large amounts of finished compost. Compost brokers report that they run out of organic feedstock in mid-summer, despite the demand for the product. One farmer explained that firewood is being shredded to meet the demand for compost because compost moves quickly. Even though firewood is worth more, the costs of cutting, stacking, curing and restacking wood are too costly for busy farmers. Delaware's soils need to have organic matter returned to the land.[10]

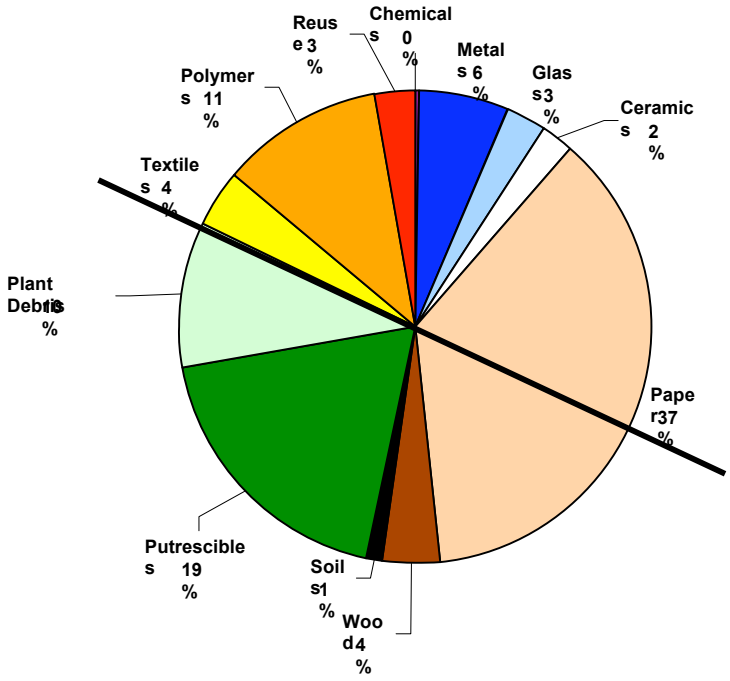
[9] Actual tonnage of materials delivered to Delaware landfills in 2005 was 1,073,992 tons. See, DSM Environmental Services, *State of Delaware Assessment of Commercial and Industrial Recycling Activity*, Delaware Solid Waste Authority, July 2006.

[10] Conversation with Diane Shields, Natural Resources Conservation Service.

Figure 2.

Delaware Discards Sorted into the 12 Market Categories

Note: Half of the Pie is Organic Material Suitable for Composting



Source: Richard Anthony Associates, San Diego, 2007

Administration Decisions: Governor Minner's Executive Order Ninety, approved on September 6, 2006, officially established a goal to divert at least 51% of the materials currently going to State landfills through composting and recycling. The Department of Natural Resources and Environmental Control, in an action consistent with the Governor's Executive Order Ninety, imposed a ban of yard debris from disposal in the state's Cherry Island Landfill as a permit condition. The ban was to take effect in January 2007. In March 2007, the ban was lifted for one year.

Assuming that the yard debris ban from Cherry Island landfill is reinstated in January 2008, the diversion of this material can lead the state to the 51% recycling and composting goal. This accomplishment would increase resource management and help the state adopt practices that preserve the environmental and economic growth. Even though the yard debris ban has been suspended, private companies have begun preparation for large-scale yard debris and food waste composting capacity.[11]

Existing Programs: The Delaware Solid Waste Authority (DSWA) has a comprehensive drop-off program for capturing certain designated recyclables and yard debris at designated landfills and transfer station locations. Drop-off recycling is the fail-safe position for any community

[11] Conversation with BJ Vinton.

program and it is to be commended and continued. The availability of composting and recycling opportunities for self-hauled loads at the landfills and transfer stations is important. However, in order to achieve substantial diversion a community must have a convenient and available combination of curbside, dockside, buy-back and drop-off opportunities to recycle materials and compostable organics and to require the generator to keep these materials separate.

DSWA also operates curbside collection of recyclables on a voluntary, subscription basis. DSWA offers curbside collection of yard debris. Some cities in the state take advantage of these curbside collection programs. These include Dover, Milford and Rehoboth Beach.

The City of Wilmington, in addition to collecting and managing its own yard debris program, has entered into arrangements with private firms to test a new incentives program, Recycle Bank/Blue Mountain Recycling. The pilot scale was a success and the city has decided to go citywide with this service. The DSWA programs and the new program design for Wilmington demonstrate that curbside collection of recyclables can be accomplished in a cost-effective manner as compared to discard collection for landfill.[12]

Most Delaware cities provide bulky materials collection but these programs typically take material to the landfill and have not been used for collecting reusable materials for sale. Existing thrift stores and collection agencies such as Goodwill Industries and the Salvation Army collect reusable materials.

Convenience is the cornerstone of participation in recycling programs. Successful recycling starts with proper storage and collection programs that keep materials sorted and not contaminated with unwanted materials. Delaware does not require its businesses or residents to recycle or compost.

In order to achieve a better than 50% diversion from disposal, reusable material needs to be separately collected and aggregated for resale, repair or dismantling. Convenience, along with education and training, will be an effective means of diverting these materials from the landfill.

Model Programs: In the l980's and l990's jurisdictions adopted new approaches to solid waste management that can inform jurisdictions in Delaware. The following communities moved quickly and cost-effectively to high levels of diversion from landfill disposal using methods that are applicable to Delaware jurisdictions.[13]

Ann Arbor, Michigan (Population: 112,000)

City programs recovered 47% of household waste. The state's bottle return law diverted another 5%. The non-profit Recycle Ann Arbor (RAA) collected 24 different recyclables weekly and also runs a drop-off station. From April through November, city crews collect grass clippings, leaves, and brush at curbside (which is banned from the landfill). The city earned $38,000 per year from compost and mulch sales.

[12] See, Evaluation of Enhanced Residential Waste and Recyclables Collection and Processing for New Castle County, Delaware Recycling Public Advisory Council, October 2003; and, State of Delaware Residential Curbside Recycling: Report Documents, January 2004; and, Analysis of Mandatory Curbside recycling Program Costs-Task B, October 2004.

[13] "*Cutting the Waste Stream in Half*," Op. Cit.

Bellevue, Washington (Population: 103,700)

Bellevue's residential waste reduction climbed from 11% in 1989 to 60% in 1996. Its pay–as-you-throw (PAYT) system, combined with comprehensive curbside collection, is the heart of the program. Almost two-thirds of customers subscribed to one 30-gallon can or 19-gallon mini-can per week trash service.

Dover, New Hampshire (Population: 27,000)

A PAYT system was responsible for Dover's residential recovery level increasing from 3% in 1990 to 52% in 1996. During the same period, per household costs for solid waste management dropped from $122 to $73.

Falls Church, Virginia (Population: 10,000)

After implementing multi-material curbside collection, Falls Church reduced trash collection from twice to once weekly and cut the number of trash crew members from ten to seven. The solid waste management budget dropped from $1.05 million in FY90 to $630,000 in FY97. Falls Church now recovers 65% of its residential waste.

Fitchburg, Wisconsin (Population: 17,300)

Fitchburg's mandatory recycling ordinance and multi-family recycling ordinance were the first in Wisconsin. It was also one of the few communities to collect clothing, toys, books, small appliances and house wares at curbside monthly. The town disposed less waste in 1996 than in 1992 despite a nearly 20% growth in households. Per household waste handling costs dropped from $126 in 1992 to $108 in 1996.

Loveland, Colorado (Population: 44,300)

In the early 1990s, Loveland overhauled its waste management system in response to rising worker compensation insurance rates and aging trash trucks needing replacement. Specially designed dual-collection vehicles now pick up recyclables and trash on the same pass through each week.

San Jose, California (Population: 873,300)

This culturally diverse urban city diverted 43% of its municipal solid waste. Single-family household diversion levels reached 55%. The city provides residential curbside recycling service to all single-family and multi-family households, PAYT trash fees, weekly year-round residential yard trimmings collection, and financial incentives for businesses to reduce waste drive San Jose's high recovery levels.

There is no one best way to recycle at the local level. But there are common themes that allow communities with high levels of diversion to reduce or stabilize solid waste management costs. Many factors contribute to cost-effective programs. One common thread is that these communities consider waste reduction a primary waste management strategy. Recycling and composting are not treated as add-ons; rather, they form an integral part of overall waste management.

Specific techniques for cutting costs include:

- Maximize diversion levels by including a wide variety of materials in the recycling and composting programs. High diversion levels can reduce costs in two major ways: (1) by significantly reducing landfill or other disposal costs, and (2) by eliminating some trash routes and their associated costs.

  High waste diversion allows Madison, to serve 10,000 more households with fewer and smaller trash trucks. The smaller trucks cost less and have lower maintenance costs. Since Worcester, Massachusetts began recycling, the city decreased trash crew size from 3 to 2 and the number of routes from 11 to 9.

- Compost

  Yard trimmings collection costs vary among record-setters, but tend to be lower than recycling collection costs because the material is homogeneous and needs less expensive, low-tech processing. In Bellevue, Washington, one-third of residential waste was composted. Bellevue residents spent about $102 per ton for composting compared to $139 per ton for recycling. Chatham, New Jersey, kept its composting program costs low by hosting a regional compost facility in return for free tipping of its grass clippings. Chatham also avoided capital outlays for yard debris recovery by leasing county equipment as needed.

- Implement PAYT trash programs

  In communities with pay-as-you-throw (PAYT) trash fees, trash disposal per household decreases. Dover, New Hampshire, instituted its PAYT system in 1991, the same year it began weekly curbside recycling. Between 1990 and 1996, per household trash disposal fell from 6 to 2.3 pounds per day. Dover's net residential solid waste management costs dropped from $1.1 million in 1990 to $798,000 while adding more than 1,000 customers. And per household costs have decreased from $122 in 1990 to $73 in 1996. Augment curbside with drop-off sites

  While curbside collection is critical to maximizing participation and therefore recovery levels, drop-off collection is generally cheaper for the community. In 1996, St. Paul, Minnesota, avoided $75,000 in disposal fees and diverted 1,800 tons of material by offering residents drop-off opportunities for bulky goods from sofas and computers to skis. In Ann Arbor, Michigan, a comprehensive drop-off center accepts materials not collected at curbside (such as building materials, hardcover books, and appliances). Their costs to collect materials through drop-off are $14 per ton cheaper than through curbside collection, and drop-off increased the city's waste reduction level by 3%. PAYT systems may also encourage the use of drop-off sites. In Dover, New Hampshire, drop-off collection accounted for 19% of all materials recovered. Their costs to collect and process drop-off materials average $14 per ton, compared to $77 per ton for curbside collection and processing of recyclables and yard debris.

- Consider dual-collection

  Loveland, Colorado, and Visalia, California, have integrated recycling completely into their solid waste management systems through use of dual-collection vehicles, which collect recyclables and trash in separate compartments on one truck. Dual-collection systems can save money by avoiding the need for two separate fleets of trucks and by increasing productivity of collection crews. Madison crews chip most brush and wood at the curb using open-bed trucks and tow-behind chippers.

- Cutting Costs
  - Collection routing, encourage back yard composting
  - Collect as wide a variety of materials as possible.
  - Collect yard trimmings for composting.
  - Use drop-off sites to augment curbside collection.
  - Distribute bins to all participants.
- Education
  - Educate, Educate, Educate.
  - Target education at new residents and at all ethnicities.
  - Repeat messages in a variety of media.
- Program Planning
  - Build broad program support during the planning stages by seeking public input, selling the program to those active in the community (such as service and civic clubs), and building political support.
  - Make program participation as convenient as possible.
  - Keep the program easy and user-friendly.
  - Investigate dual-collection, especially when faced with an aging trash fleet.
  - Learn from others' experiences. Find out what other communities have accomplished and how they did it.
- Policies
  - Implement a pay-as-you-throw trash system (and include small container options).
  - Encourage source reduction and reuse.
  - Pass a local ordinance requiring residents, businesses, and institutions to participate in waste reduction activities or requiring haulers to offer their customers (residential and commercial) a minimal level of recycling service.
  - Enforce mandatory programs to boost both the quantity and quality of participation.
  - Offer recycling services to multi-family households, require haulers to provide these services, or require that multi-family building owners/managers provide recycling services to their tenants.
- Ongoing Programs
  - Be prepared for resistance to change. Try to anticipate likely questions.
  - Seek out committed staff and administration to ensure program success.
  - Secure stable markets for reusable items and recyclables.

- Avoid adding a material to the recycling program and then taking it away, especially if the trash system is pay-as-you-throw.
- Track data to document success.

➢ Program Outreach

- Recruit and reward citizen volunteers, who have many skills and can help maintain community motivation.

III. Commodity Analysis

A. Materials Discarded in Delaware Landfills

A resource management approach to Delaware's current level of landfilling materials starts with an understanding of the amount and value of those resources. ILSR used waste characterization percentages of disposed materials from the SCS Engineers Waste Characterization Study for the DSWA, dated December 1997. The report uses one million tons generated in the state annually as a rounded figure for discussion purposes. (As noted the actual tonnage figures for materials delivered to Delaware landfills in 2006 was 1,175,306 tons.)

The report has the aggregated percents of resources buried in the Delaware landfills sorted into 12 market categories to provide a reasonable expectation of the amount and value of materials currently being disposed.

Table 2 shows the materials disposed in Delaware landfills sorted into 12 market categories. Originally developed by Dr. Knapp of Urban Ore, Berkeley, CA, materials are sorted into market categories based of estimated composition in the landfills.

Table 2: Composition and Weight of Materials Disposed in Delaware Landfills

Categories	Percent *	Annual Tons
1. Reuse	2.8	28,000
2. Paper	37.0	370,000
3. Plant Debris	10.0	100,000
4. Putrescibles	19.0	190,000
5. Wood	4.0	40,000
6. Ceramics	2.0	20,000
7. Soils	1.0	10,000
8. Metals	6.0	60,000
9. Glass	3.0	30,000
10. Polymers	11.0	110,000
11. Textiles	4.0	40,000
12. Chemicals	0.2	2,000
Total	**100**	**1,000,000**

**SCS Engineers, Waste Characterization Study, DSWA, l997*

Over half of the material is good feedstock for compost if kept segregated from the other categories. Most of the reusable items can be repaired and resold or dismantled for recycling. Some of these items are considered toxic and hard-to-dispose-of special wastes (e.g., fluorescent lights, batteries, paints, medicines)

B. Market Value

ILSR confirmed the values of recycled materials in conversations with mills and brokers in the Mid-Atlantic Region and a review of monthly revenue figures from the DSWA. Buyers and processors of reusable materials (Goodwill Industries and The Salvation Army) were contacted and values for the categories are estimated.

Today's market values are greatly influenced by demand for all recycled materials from Asian economies, especially China and India. India and China are now industrialized, with a large middle class, and make up one half of the world's population. Their industries depend on secondary resources as their primary industrial feedstock. Fuels to drive these industries (coal and oil) are also being consumed at an exponential rate, driving up the cost of energy for industry and consumers.

The energy savings from maximum recycling vs. use of virgin materials are driving the materials recovery markets today and for the foreseeable future. These economic and social dynamics have made secondary materials (metals, paper and plastic) leading exports from USA ports.

Based on these actual market values, the current annual value of material buried in Delaware landfills is nearly $74 million. Table 3 provides the estimated value of the discarded material assuming 100% recovery and conservative revenue for materials. These market values can be increased with additional processing. The value after high grading e.g. separating the non ferrous from the ferrous metal with a magnet will greatly increase the value of the metals; then the non-ferrous metal can be separated further into semi precious and precious metals. The same can be said for paper which when mixed is worth $100 per ton but sorted into higher grades can be worth $250 per ton.

Table 3: Potential Economic Value of Recycling Discards Currently Landfilled in Delaware

Categories	Annual Tons	Revenue $/T[1]	Estimated Value/$
1. Reuse	28,000	550	15,400,000
2. Paper	370,000	100	37,000,000
3. Plant Debris	100,000	10	1,000,000
4. Putrescibles	190,000	10	1,900,000
5. Wood	40,000	8	320,000
6. Ceramics	20,000	4	80,000
7. Soils	10,000	10	100,000
8. Metals	60,000	40	2,400,000
9. Glass	30,000	10	300,000
10. Polymers	110,000	100	11,000,000
11. Textiles	40,000	110	4,400,000
12. Chemicals	2,000	15	30,000
Total	**1,000,000**		**73,930,000**

Source: Richard Anthony Assoctaite, San Diego, 2007

Recovery is never 100%. Table 3 demonstrates the total value of materials currently disposed in Delaware landfills. Systems have been designed that can capture 90% of designated categories. The recovery value of each of the categories is directly related to infrastructure, training and public education programs.

Thus at 50% recycling and composting levels, the total gross annual value of discards going to the state's landfills is just under $37 million. At 75% recycling and composting levels the total annual value is estimated at $55.5 million.

In addition to the direct economic value of the resources in the state's discard stream, significant additional, indirect, value is associated with the market figures above. Solid waste has a negative economic value when disposed. Assuming a $50 per ton cost of disposal at State landfills by recycling one million tons annually, the state's households and businesses will potentially save $50 million in expenses they currently bear. Collecting recyclables has been shown to be as cost effective as collecting materials for disposal.[14]

At 50% recycling and composting levels, this savings to households, businesses and cities in Delaware is $25 million annually; or 50% of the current cost of disposal. At 75% levels, the savings is $37.5 million annually, or 75% of the current cost of disposal.

[14] See, *Evaluation of Enhanced Residential Waste and Recyclable s Collection and Processing for New Castle County*, October 2003; and, *State of Delaware Residential Curbside Recycling: Report Documents*, January 2004; and, *Analysis of Mandatory Curbside Recycling Program Costs: Task B*, October 2004.

Thus the total potential value (market value of materials and avoided disposal costs) added to the Delaware economy annually can be between $62 million at the 50% level ($37 million + $25 million) and $93 million at 75% level ($55.5 million + $37.5 million), justifies source separation of materials as opposed to disposal of mixed materials.

Table 4: Potential Value in Delaware Resource Management

	50%	75%
Market Value	$37 million	$5.5 million
Avoided Cost Value	$25 million	$37.5 million
Total Annual Value	$62 million	$93 million
Total Program Value (6 years)	$372 million	$558 million

These economic values are not 'net' values, as the public and private sector must invest in infrastructure to achieve high recovery rates. It is ILSR's contention that the investment of $20 million over 6 years, plus the normal business investments to maintain company efficiencies, will allow the State's economy to realize the values estimated for the 50%, 75% and higher recovery rates.

The best approach for the state assumes the following:

- A public education program;
- Training for managers of public and private facilities;
- Provision of opportunities to recycle at all areas where materials are discarded;
- An industrial product redesign program; and
- A phased-in requirement for source separation for both residential and commercial generators.

C. Employment Potential

Materials recovery is an economic development tool as well as an environmental tool. Reuse, recycling, composting, and waste reduction offer direct development opportunities for communities. Discarded materials are a local resource that can contribute to local revenue, job creation, business expansion, and the local economic base. On a per-ton basis, sorting and processing recyclables alone sustain 11 times more jobs than landfilling or incineration. However, making new products out of the old offers the largest economic pay-off in the recycling loop. New recycling-based manufacturers employ even more people and at higher wages than does sorting recyclables.

ILSR's report, "Salvaging the Future: Waste-Based Production," looked at how many recycling-based manufacturing plants a city of 1 million people could sustain on its waste stream. It found that 6 paper mills, 1 glass container manufacturing plant, 51 plastics

processing and manufacturing plants, and 2 aluminum smelters could operate. These plants would create 1,500 jobs and add more than $250 million to the local economy.

In order to compare jobs created through recycling with disposal, a decade ago ILSR developed job-to-ton ratios for specific material streams based on direct interviews with operating facilities. These factors are shown in the table below.

Table 5: Job Creation: Reuse and Recycling vs. Disposal

Categories	Jobs per 10,000 TPY
Product Reuse:	
Computer Reuse	296
Textile Reclamation	85
Misc. Durables Reuse	62
Wooden Pallet Repair	28
Recycling-Based Manufacturers:	25
Paper Mills	17.5
Glass Product Manufacturers	26
Plastic Product Manufacturers	93
Processing Facilities:	
Conventional Material Recovery Facilities	10
Plastics Processing Facilities	30
Metal Reclaimers	6
C&D Processors	2.5
Composting	4
Landfill and Incineration	1

TPY = Tons Per Year
C&D = Construction & Demolition
Note: *Figures are based on ILSR interviews with 114 facilities around the country.*

Applying these job-to-ton ratios to Delaware's discards, indicate that 1,574 jobs could potentially be created if half the state's discarded materials were recovered. See table shown below. If the recovery rate reached 75%, the number of jobs sustained could jump to 2,360. Furthermore, thousands of indirect jobs could be created as well.

Table 6. Jobs from Discards in Delaware at 50% Recovery

Categories	Tons/Year Generated	Projected Tons/Year Recovered	Potential Local "Processing" Jobs	Potential Regional Manufacturing Jobs	Total Potential Jobs @ 50% Recovery
1. Reuse	28,000	14,000	87	---	87
2. Paper	370,000	185,000	153	323	476
3. Plant Debris	100,000	50,000	20	---	20
4. Putrescibles	190,000	95,000	38	---	38
5. Wood	40,000	20,000	8	---	8
6. Ceramics	20,000	10,000	2	---	2
7. Soils	10,000	5,000	2	---	2
8. Metals	60,000	30,000	17	71	88
9. Glass	30,000	15,000	16	40	56
10. Polymers	110,000	55,000	114	512	625
11. Textiles	40,000	20,000	170	---	170
12. Chemicals	2,000	1,000	n/a	n/a	n/a
Total	**1,000,000**	**500,000**	**628**	**945**	**1,574**

Note: *Figures represent one possible scenario and are based on job-to-ton ratios shown in previous table. Jobs for recovery of plant trimmings, putrescibles, wood, and soils are based on the composting job-to-ton ratio. Ceramics are assumed recovered as an aggregate at a construction and demolition recovery facility. For polymers, half the recovered tonnage is assumed processed at a conventional material recovery facility and the other half at a dedicated plastics processing facility.*

IV. Recommendations

An expanded recycling and composting program that supports municipal, county and private recycling and composting, financed through a surcharge on generation, can adequately finance efficient planning and implementation, training of future managers of generating facilities, and enhancing public awareness of the need for and convenience of recycling and composting. This can lead to achieving the state goal of 51% diversion level from landfills within three years. In addition, with an infrastructure in place, a phase-in of legislation that requires separation can be accomplished based on a public benefit rationale and economic efficiency rationale. With required separation, the State can achieve even higher levels of diversion, and hence enhanced environmental and economic security.

ILSR suggests that DNREC introduce polices that recover and reuse discarded material resources in Delaware.[15] Traditionally, source separation has been the means to guarantee material quality sold to local industry. For Delaware citizens old enough to remember World War II, curbside recycling and overall frugality are not foreign ideas. Organics were collected for the hog farmers and glass and metal for recycling. Special drives for newspapers and metals served a vibrant scrap industry and then a dramatic war effort. This older generation followed these practices through the l950's as a matter of second nature, before the throw away economy took root. For younger citizens of Delaware, the dramatic findings on global warming and the need for sustainable economic development serve as motivation and explanation for why the time has come for recycling and composting instead of landfilling valuable materials.

Population increases and the ability to measure and regulate pollutants from environmental emissions in the interest of public health present a new future for discard management in Delaware.

Cost-effectiveness is another motivating factor for all Delawareans. Due to increasing world population and finite resources, the value of materials and products has risen.

DNREC is positioned to start the programs that will provide public conservation information and administrate grants to develop resource management infrastructure in Delaware. New education and public awareness programs should complement and reinforce current DSWA programs. To get the program started ILSR recommends a state legislated program that includes grants for infrastructure, infrastructure, public education, management training and required separation. These recommendations seek to provide a comprehensive resource management program that will allow the state to reach and surpass the 51% goal.

A. Proposed Program

ILSR recommends the following program for Delaware:

Introduce a surcharge on material collected for disposal at the landfill. This surcharge will fund capital equipment, labor and planning and reporting services needed for recycling and composting programs operated by local jurisdictions, nonprofits, and certain government facilities (such as athletic stadiums, parks and libraries), and private businesses. Cities, counties and states throughout the US have used surcharges. Alameda County, CA has a $15 per ton surcharge. A $10 surcharge has been proposed for Marin County. CA, San Jose, CA has a $19 surcharge on landfilled materials. Pennsylvania imposes a $10 per ton fee. Funds collected are used for grants to recycling and composting companies, city and county programs; education, training, open space acquisition, household hazardous waste collection, law enforcement and planning.

[15] The independent Alameda County Recycling Board, which manages surcharge funds for investments in recycling and composting, is an alternative model. See, *Innovation, Leadership, Stewardship: The Alameda County Waste Management Authority & The Alameda County Source Reduction and Recycling Board*, ILSR, 20002.

The surcharge would fund a statewide public education program for the State of Delaware. This would include funding for hotlines, websites, contracted social marketing, training workshops for industry sectors and information programs as well as administrative staff.

A portion of the funds could also be used to support community colleges, technical and trade institutions and university level resource management courses that will prepare business and government management personnel to initiate and manage these new directions. Training workshops for selected industries would also receive support from this portion of the funding program.

A final portion of the fund will provide management support to DNREC and local jurisdictions to implement and monitor.

The six-year surcharge will raise an estimated $20 million, based on the current level of generation and declining volumes over the six-year period as recycling and composting levels rise. ILSR has confirmed that current minimum values for materials from markets within the state and in surrounding jurisdictions could be $240 million statewide over this same six-year period, assuming an average of 50% recycling and composting for these years. Avoided tip fees of an additional $150 million, assuming an average of 50% recycling and composting over the six-year program, for jurisdictions and businesses that can manage their resources away from the landfill. This assumes an average tip fee of $50 per ton at Delaware landfills.

Discussions with DSWA officials indicated their support for a surcharge that is not collected as part of the tip fee at state landfills, and they support phased-in required separation. DSWA is enhancing its recycling and composting capacity as a part of its overall services.

DNREC would administer the grants program and take responsibility for public awareness and in-school education, including the establishment of training programs at public and private schools, colleges and universities in the State. DNREC would also provide oversight of grants to local agencies and companies for managing these programs that are appropriate for consideration by Delaware State and local governments.

The proposed program would complement to DSWA, municipal and private hauler efforts.

Although this report recommends the eventual implementation of required source separation, ILSR suggests that it be phased in the fifth year of the implementation of the grant and training program, or sooner. This approach is advised given the current climate in which mandatory source separation is considered politically untenable within the State legislature. Once the funding program enhances the infrastructure for convenient and cost-effective recycling and composting is established, the political hesitancy to commit to mandatory recycling should diminish.

This approach parallels the consensus found among stakeholders interviewed that “a program needs to crawl before it can walk.” And, that Delaware needs to have recycling and composting opportunities available, training for managers, and a uniform statewide program for reuse, recycling and composting in place before separation becomes mandatory. Stakeholders pointed to the mixed signals coming from administration and elected officials as verification of their

expressed views. Once these programs are in place, a requirement for source separation can be readily implemented on the principle that these are common sense rules for people who live, work and recreate in Delaware.

Finally, grant funds need to be made available to planning agencies to prepare environmental reports on composting and recycling processing facilities. This will allow the State to keep records and to relieve facility operators from costly and needed environmental reports.

B. Training

In order for Delaware and its jurisdictions to make reuse, recycling and composting as convenient and available as possible, it is critical to teach residents how to use the programs and to train the program managers how to operate their programs. Professional social marketing firms that develop programs (e.g., signage and information) should be brought in to help design and initiate programs.

A great deal of experience has been developed in the Mid-Atlantic and Northeast regions of the US over the last 25 years. The State of New Jersey has had a required separation ordinance that dates back to the 1980s and thus have trained program managers and compliance officers to implement the rule. These trained recycling coordinators have been hired by jurisdictions across the US. Other states have pioneered in banning construction and demolition debris from landfills (Massachusetts), banning electronic waste from landfills and incinerators (Maryland), developing sophisticated procurement protocols (Maryland), establishing mercury switch return programs (Rhode Island and New Jersey), and establishing highly regarded professional recycling and composting associations (Pennsylvania, Virginia, Maryland). From these established networks of professional recycling coordinators, entrepreneurs and educators, Delaware can draw experts who can assist in the training of the managers for the state's future resource management system.

Delaware needs to set up through the community college, technical college and university, resource management training programs that provide progressive certification and degrees in Managing Resources. The lack of formally established training programs (including the use of libraries and research labs) is a significant barrier. Some programs exist in environmental sciences and natural resources, and these disciplines are logical places to organize certificate and degree programs in resource management. Business school programs also need to incorporate resource management into their degree and certificate program offerings.

In general, solid waste management professionals are not trained in resource management. A Resource Manager should have skills in clean production, product redesign, waste reduction, collection for reuse, recycling and composting. While waste management must handle materials not diverted through recycling and composting, resource management requires a unique set of additional skills.

The State's resource management training program must involve public and private, junior colleges, colleges and universities. An internship program in high schools for academic oriented and blue collar oriented students is a strategy for career development in the resource management field.

C. Financing

Funding for a state resource management program is needed primarily for staff administrators, training and education, and capacity building in the public and private sectors. This can be accomplished with a surcharge whose proceeds are invested in resource management. A $6 per ton resource management charge on the materials currently in the municipal solid waste stream that are collected and disposed at the landfills in Delaware, would provide $20 million in funding over 6 years for equipment and program design; monitoring grants to cities and private resource management companies that meet the state criteria; social marketing firms who help design and train staff in implementing public education programs; the materials for these programs; and a comprehensive community, technical and university education and degrees in Resource Management.

Table 7. Projected Revenue from $6 per ton Surcharge on Municipal Solid Waste Generated in Delaware

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	TOTAL
Tons diverted	130,000	250,000	400,000	500,000	650,000	750,000	
Total generated	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	
Tons landfilled	870,000	750,000	600,000	500,000	350,000	250,000	
% Diverted	13%	25%	40%	50%	65%	75%	
Surcharge $	$5,220,000	$4,500,000	$3,600,000	$3,000,000	$2,100,000	$1,500,000	$19,920,000

ILSR recommends the following formula for allocating funds annually:

- Infrastructure for cities and private companies 25%
- Managers (college and university credited programs) 25%
- Public awareness and education 25%
- Technical assistance and administration 25%

ILSR anticipates the following diversion levels as a result of this investment in public and private recycling and composting operations.

Table 8. Diversion Rate over 6 years

	Start Year	End Year 1	End Year 2	End Year 3	End Year 4	End Year 5
Recycling/ Composting Diversion Rate	13%	25%	40%	50%	65%	75%
Tons Diverted Per Year	130,000	250,000	400,000	500,000	650,000	750,000

D. Observations

Pollution Prevention: Recycling and composting are necessary but not sufficient for the state to reach the highest levels of diversion from landfill disposal, even beyond the 75% level. To go beyond this diversion level, ILSR recommends an expanded pollution prevention program within DNREC. Additional staff is needed to focus on 'upstream' issues, that is, issues of design and material content prior to products and packages reaching the discard stream. Pollution prevention focuses on clean manufacturing, product design for reuse and recycling, and manufacturer responsibility for their products and packages. Pollution prevention can also mean banning certain products and packages. Berkeley, California, banned the use of polystyrene containers. Most recently, San Francisco banned the use of plastic retail bags.

ILSR recommends pollution prevention training, development of incentives, bans for products and packages that pose too much of a burden on the discard stream and the environment, and stewardship negotiations with Delaware industry. ILSR further recommends that DNREC establish a pollution prevention task force comprised of state and local government officials, industry representatives and citizen representatives. This permanent advisory committee should meet once a quarter to pursue pollution prevention within the state's industrial sector. Models for such stewardship programs are the California Stewardship Institute and the Northwest Stewardship Council.

On Farm Composting: In order to encourage recycling within the Delaware agricultural community ILSR recommends that DNREC initiate a composting program for farmers through the general permit process. Such a general permit would allow the composting of yard waste, source separated food scraps, and soiled papers from food markets, grocery stores, food banks, food distribution centers, school cafeterias, and institutions This permit would allow farmers to connect with their local community grocery stores, schools and institutions to help them manage organic discards in an environmentally beneficial manner, generate income through tipping fees and produce a valuable soil building amendment to use back on the farm. The State of Pennsylvania has just introduced such a permitting system for farmers who want to compost materials generated off the farm.[16] The Governor of Pennsylvania has recently proposed a financing program of several hundred million dollars to accelerate this approach.[17]

[16]For Pennsylvania permit information and forms go to:

Franchised Hauling: The State should explore the use of franchising districts within Delaware as a means to stimulate recycling and protect local, small hauling companies. Portland, OR used franchise districts to preserve 52 small hauling companies. The city was divided into 52 districts and each hauler was given the exclusive right to curbside service for discards. The franchise agreement required the hauler to offer recycling service. One hauler could own just a limited number of franchises.

By contrast, in New Castle County, DE, the county has given a franchise to one large national company to serve all districts that are formed for recycling in the unincorporated area. The result has been a precipitous drop in the number of small haulers in the county.

During stakeholder meetings and at public forums the idea of giving one hauler the recycling franchise for the entire state was raised as a possibility to increase recycling in the state. The consensus was that this is not an appropriate approach to franchising or recycling, as it limits competition and ingenuity.

ILSR recommends that DNREC and Delaware counties consider a Portland-type franchise system based on local haulers providing recycling and composting services. This would allow the state or counties to define the appropriate levels of services offered by local haulers.

V. Conclusion

This report presents a commodity-based analysis of Delaware's current municipal solid waste management system. The surcharge and grant program policy recommended can provide the needed capital, public awareness and training needed to stimulate a transition to resource management from waste management.

VI. Appendices

A. Contact List

Jerry Abernathy, *Recycle Office Equipment, Inc.;* Robert Anderson, *Blue Mountain Recycling;* Alfonso Ballard, *Department of Public Works, Wilmington, DE;* Steve Ballard, Delaware *Partners in Technology, Department of Education;* Susan Barton, *University of Delaware Extension Service;* Paul Bickhart, *Recycling Express of Delaware: Recycling Public Advisory Council;* Bruce Blessing, *Blessing Greenhouse and Compost Facility;* Bernie Brill, *Council for Textile Recycling;* James Brunswick, *Citizen;* Valann Budischak, *Delaware Nursery and Landscape Association;* Sarah Burns, *DSWA;* Lisa Caldwell, *Waste Management, Inc.;* Jay Caldwell, *Caldwell's Waste Hauling, Inc.;* Jesse Chadderdon, *Community News;* Wally Chaulk,

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http://www.dep.state.pa.us/dep/deputate/airwaste/wm/recycle/compost_sum/GP-farm.htm. For description of how one farm integrated composting with manure management and soil production go to EJF@twoparticularacres.com. This farm is located in Royersford, PA.

16 Conversation with Linda Knapp, Mid-Atlantic Consortium of Recycling and Economic Development Officials.

Delaware Farm Bureau; Steve Chafitz*, EENDUSA.COM;* Phillip Cherry, *Office of Policy and Planning, DNREC;* Garrett Copeland, *Salvation Army;* Kevin Coyle, *Office of Planning, DNREC;* Bill Davidson, *Able Recycling, Inc.;* Kelly Davis, *DSWA;* Jerry Eusach, *Dummont Textiles, Inc.;* Charles Evyalfrie, *Goodwill Industries;* Rich Flammer, *Composting Entrepreneur;* Jeff Flynn, *City of Wilmington;* Michael Gajewski, *CANUSA, Inc.;* Bruce Georgov*, Independent Waste Hauling, Inc.;* John Giles, *Manager, Town of Elsmere, DE;* Curtis Grey*, WDEL Radio;* Simeon Hahn*, Citizen;* Bryan Hall, *State Office of Management and Budget;* Robert Hartman*, DNREC;* Curt Hatfield*, BrightFields, Inc.;* Rich Hefforn, *Delaware Chamber of Commerce;* Marcus Henry*, Wilmington Department of Housing;* Don Holder*, Ingrham, Inc.;* Connie Holland, *Delaware Department of Planning;* Daniel Houghtaling, *Delaware Technical and Community College;* Thomas Houska, *Delaware Solid Waste Authority;* John Hughes, *DNREC;* Herb Inden, *State Office of Planning;* Jamie Jamison, *Delaware Grounds Management Association;* Wally Kemer, *Council of Civic Organizations of the Brandywine 100, and, Delaware Environmental Alliance for Senior Involvement: RPAC;* Jacob Kreshtool*, Citizen;* Janet Kilpatrick, *Delaware House of Representatives;* Scott Koenig, *Dover Department of Public Works;* Paul Lane*, Clean Earth, Inc.;* Ralph Larimore, *Farmer;* Steve McCann*, MT Cuba Center;* June McCarter*, Citizen;* Mike Loftus, *Professional Grounds Management Society;* Linda Knapp, *Mid-Atlantic Consortium of Recycling and Economic Development Organizations;* Nancy Marker, *DNREC;* Pam Maier, *Delaware State Representative;* Jack Markell, *Delaware State Treasurer;* David Matushik, *Green Delaware Recycling, Inc.;* Rick Mickowski, *New Castle Conservation District;* William Miller, III, *DNREC;* Stan Mills, *City of Rehoboth Beach;* Tom Moses, *Spill Center, Inc.;* Alan Muller, *Green Delaware;* Kevin Naughton, *O'Fig Sanitation;* Wayne Naylor, *US EPA, Region 3;*Bud Newman, *Newman Paper Company;* David Newman, *Newman Paper Company; James Newton, Kent County Department of Public Works;* Timothy O'Connor, *Sierra Club of Delaware ;*Craig Olsen, *BrightFields, Inc.*;Carole Palmatary, *Hockessin Sanitation, Inc.;* Linda Palmatary, *Palmatary's Sanitation, Inc.;* Michael D. Parkowski, *Lawyer;* Michael Parkowski, *DSWA;* Wendy Pizzadili*, DSWA;*Coralie Pryde, *Citizen;* Marlene Rayner, C*itizen;* Ted Reiff, *The Reuse People;* Steve Rohm, *Blessings Greenhouse and Compost Facilit*y; William Rohrer, *Delaware Department of Agriculture;* Maurice Sampson, *Niche Recycling, Inc.;* Jen Scharf*, Clean Earth, Inc.;* Charlie Seaver*, Citizen;* Diane Shields, *Natural Resources Conservation Service;* James Short, *DNREC;* David Small, *DNREC;* Debbi Smedley, *Delaware Sanitation, Inc.*; Wayne Smith, *Delaware State Representative;* Ray Soden, *Desabatino Tree Service;* Andrew Stanton*, Legislative Consultant, Inc.;* Bill Stoll, *RPJ Waste, Inc.;* Tracy Timson, *Citizen;* Brock Vinton, *Recycling Public Advisory Council;*

Mark Uhar, *Rogers Brothers Company;* Lee Ann Walling, *Office of the Governor, Environmental Advisor;* Rick Watson*, DSWA;* James D. Werner, *DNREC;* James Wilson, *Wilmington College;* William T. Wood, Jr., *Wood and Associates;* George Wright, *Delaware League of Local Governments, and, Recycling Public Advisory Council.*

B. Stakeholder Interviews

ILSR conducted over 85 interviews with stakeholders throughout Delaware including diverse business, government, community and environmental interests. ILSR found contradictory opinions. Virtually all interviewed agreed that required separation (mandatory recycling) was essential for achieving high rates of diversion. Yet they believed that mandatory recycling was politically impossible at this time.

Citizens, environmentalists, seniors, farmers, nursery and grounds keeping business people expressed a keen desire to recycle more materials for a variety of reinforcing reasons (reduced pollution in general, reduced pollution coming from state landfills, local economic growth, need for raw materials (including compost) and stewardship education for the next generation).

They expressed a definite frustration with government and the hauling industry for not developing the capacity to provide comprehensive recycling services. Among the specific issues raised were: lack of public awareness and in-school education programs, lack of information about how haulers and residents are to address the yard debris ban from the Cherry Island landfill, and the need for mandatory recycling.

ILSR's conversations with government officials at the state and local level revealed agreement with these opinions with some caveats. They agreed that mandatory recycling was needed in order for the state to reach high levels of recycling. Yet they consistently stated that such a mandatory approach (required source separation) would be 'dead on arrival' before the state legislature. These officials perceived no overall demand for mandatory recycling. They specifically expressed that Delawareans are different from other citizens in that they "do not want to be told what to do." A few government officials shared that eventually the influence of surrounding states such as New Jersey and Pennsylvania, which require source separation recycling, will influence Delawareans. These officials did acknowledge that in recent years Delawareans and their elected officials did accept "being told what to do" with regard to seat belt law and, more recently, anti-smoking law.

Another issue discussed at great length by stakeholders was the role of the DSWA. Some viewed the DSWA as a state authorized monopoly that restricts the development of comprehensive source reduction, recycling and composting and the businesses that can use these materials for new production. Other stakeholders claimed that the DSWA monopoly protects Delaware's small and medium sized hauling firms from being driven out of business by much larger national firms. Further, these stakeholders point out that DSWA is the recycler of last resort, which is an important function. Redundancy in recycling capacity, on the part of DSWA and private haulers was not seen as a bad thing.

All haulers were unanimous that a surcharge of materials generated was an unwelcome tax on their customers; and they are opposed to this approach to raise capital. The haulers do not trust government to handle the grant funds efficiently. Small haulers in particular feel that even if grants from the surcharge funds are provided to private haulers for equipment and facilities, they are at a great disadvantage, as they do not have the staff to devote to responding to grant applications. Several haulers suggested that increasing overall taxes to pay for needed recycling and composting infrastructure was much fairer. Another concern was so-called 'surcharge creep' meaning that once a surcharge is enacted there is little to be done to stop the surcharge amount from being increased. Indeed, there are actual examples of this phenomenon. The original surcharge in Alameda, California, was $6 per ton. This was raised to $7.47 per ton in 2007. The Pennsylvania surcharge started at $3 in l988 and will be $10 per ton if pending legislation passes. Another concern was that the government would use the surcharge funds for non-recycling activities.

Small and medium sized haulers expressed strong disapproval of any franchising or districting system for recycling services or solid waste services. Small haulers strongly believe that competition is essential and that franchising, as in the form of Kent County's districting arrangements, limits their ability to acquire new customers. Given an even playing field, the haulers maintain that they can compete effectively. But the franchise arrangement in Kent County is not an even playing field. Only a few companies can afford the multi-million dollar bond needed to bid on a franchise. Even if a small or intermediate sized hauler would win a franchise, the company would have to bid again on the franchise in 3 years. Haulers think that they are better off building their business one customer at a time, in order to build loyalty and not risk their business on winning a bid for a franchise every three years.

One hauler has petitioned the courts to allow households in Kent County that are part of an existing district served by the franchise hauler, Allied Waste, to opt out of the district and be allowed to sign up with non-franchised haulers. Independent haulers believe that the DSWA plays an important role in providing a disposal system for recyclables, solid waste and yard debris.

One stakeholder stressed that while hauler concerns regarding the implementation of franchising are valid and must be taken into consideration, Delawareans should not lose sight of the fact that franchising offers significant benefits such as reduced collection costs, increased collection efficiency, reduced road ware, noise, and mobile source emissions and increased safety due to reduced truck traffic. All of these factors must be considered when discussing franchising.

A small and intermediate size hauler pointed to the recent experience with the yard debris ban, which was supposed to go into force in January 2007, but was postponed for at least one year in March. Several of these haulers cooperated with DNREC and alerted their customers to the pending yard ban. They invested time in educating customers, printing and mailing information, buying new equipment based on DNREC's assurances that the ban would be in effect in January. They primed their customers through a great many phone calls. Haulers felt "stabbed in the back" when this program was postponed. One hauler is planning to bring legal action against DNREC in order to recover expenses related to the company's preparation for the yard debris ban. Still haulers remained willing to continue working with DNREC to develop a good program for next year. They fear a "flip-flop" but acknowledge that they have to cooperate and make sure that the system remains competitive. Haulers are confident that they did and can again make the changes needed to adhere to the yard debris ban from Cherry Island landfill. They want consistency in policy and then they can figure out how best to achieve the goals of the ban and their business and customers. Most haulers were ready to provide yard debris collection service when the ban was postponed.

The recommended path forward to address these concerns, which are detrimental to advancing resource management in Delaware, should include regular meetings with stakeholders to review plans, programs and results. The agenda of these stakeholder meetings should include upstream issues, like clean production and product/package redesign, as well as down stream (such as capturing reusable products, organics and recyclables).

C. ILSR – DNREC Scope of Work

1. Kick-Off meeting with DNREC and other state officials
2. Review and analyze key documents pertaining to solid waste management plans and legislation
3. Review waste characterization and demographic data
4. Review current market data in the Mid Atlantic Region
5. Review infrastructure capacity of private haulers and state and local agencies
6. Identify and interview key stakeholders in Delaware, listen carefully
7. Conduct public meetings in Wilmington, New Castle County, Kent County and Sussex County
8. Analyze data and stakeholder interviews
9. Identify policies, institutional arrangements, including alternative models, for state, county, city, and rural maximum diversion programs; financing options; cost factors; equipment, marketing needs; and make recommendations for new rules and regulations
10. Prepare draft report for distribution and discussion among stakeholders
11. Undertake additional research and interviews as needed
12. Prepare and submit final report for DNREC and stakeholder final review
13. Conduct forum on report for DNREC and stakeholders at a time and site mutually determined by DNREC and ILSR.

D. Technical Documents Reviewed

SCS Engineers, Waste Characterization Study, DSWA, l997

Recycling Economic Information Study, June 2000

Evaluation of Enhanced Residential Waste and recyclables Collection and Processing for New Castle County, Delaware Recycling Public Advisory Council, October 2003

Analysis of the Impact of a Yard Waste Ban on Landfill Quantities and Household Costs, DSWA, September 2004

Analysis of Mandatory Curbside Recycling Program Costs: Task B, October 2004

Comprehensive Annual Financial Report: Fiscal Tears Ended June 30, 2006 and 2005, Elko & Associates/DSWA, October 2006

Estimated Statewide Residential Recycling Rates, DSWA, November 2004

State Mandatory Curbside Recycling Program, November 2004

State of Delaware Residential Curbside Recycling: Report Documents, January 2005

The Application of Life-Cycle Analysis to integrated Solid Waste Management Planning for the State of Delaware, DSWA, May 2006

Solid Waste Management Alternatives for Delaware, Solid Waste Management Technical Working Group, May 2006

State of Delaware: Assessment of Commercial and Industrial Recycling Activity--Final Report, July 2006

E. Exemplary programs and Enterprises Business Models

ADVAC Elastomers, Milwaukee, WI: This Company recycles industrial rubber including tires and produces a product that is substitutable for virgin rubber at lower costs to manufacturers. The company specializes in tolling arrangements whereby a generator ships its rubber discards to Milwaukee and the truck returns with raw materials for manufacturing. The company also has a plant in Vidalia, LA. Each plant will employ from 60-115 workers when at full capacity. A plant has the capacity to process 40 million pounds of industrial rubber annually. The company offers host community fees for communities that assist in providing industrial land for a new plant.

Alameda County Recycling Board, Oakland, CA: This ARCB evolved from the Alameda County Waste Management Authority & Alameda County Source Reduction and Recycling Board. A 63 majority established the Boards in November 1990 as a result of a citizen referendum. The measure was a ground-breaking local initiative with the following key features: a voter approved surcharge of $6 per ton (subsequently raised) on trash landfilled in the county, a long term diversion goal of 75%, and a prohibition on refuse incineration in unincorporated areas of Alameda County. The ACRB oversees research, business implementation and planning grants to local government agencies and private firms.

Blessing Greenhouse and Compost Facility, Milford, DE: This private enterprise composts a variety of organic materials including dead chickens form the poultry industry, manure and shredded yard debris. Materials are processed and cured with windrows enclosed in film plastic bags. Revenues derive from sale of flowers grown in compost and sale of high quality compost. This company serves several critical needs in the state. It manages poultry waste in an environmentally friendly manner, which allows the industry to thrive in the State. It needs two units of shredded yard debris for every unit of dead chickens, thus creating a viable market for yard debris once the State ban on yard debris becomes effective, and it provides an in-state source of valuable compost, reducing the need to import materials from outside the state.

Computer Donation Management, Baltimore, MD: This Company refurbishes computers and has established joint ventures with non-profit organizations in VA and WV. The company resells operating computer systems internationally and recycles non-refurbishable parts in an environmentally accepted manner. The company employs sheltered workers for disassembly and more skilled workers for assembly.

Growing Power, Milwaukee, WI: This Company operates greenhouses for composting, vermicomposting, aquaculture and a fresh vegetable market. The company uses coffee grinds collected from coffee houses in Milwaukee. The company is replicating its facility in

conjunction with a community development organization on the Westside of Chicago, IL. Working arrangements with surrounding farmers are a key aspect of Growing Power's 'food security' program.

Partners in Technology, Delaware Department of Education, Dover, DE: This program refurbishes computers and software and provides them for free to Delaware schools. From 900 to 1,200 computers annually are fixed. The program also offers free technical assistance, upgrades and training to participating schools. The program started as an independent non-profit organization, but was incorporated as an agency within the Department of Education.

Recycle Bank/City of Wilmington, DE: Recycle Bank is a private enterprise that has worked with the city pilot program featuring economic rewards (through valuable coupons) distributed to households on the basis of the amount of recyclables generated by the household. Coupons are redeemable at national chain stores as well as locally owned businesses. The pilot project resulted in over 90% participation. The city has decided to roll out the program to all households in the city.

Second Chance, Inc., Baltimore, MD: This Company is 3 years old and has 40 workers including deconstruction crews and retail staff that sell used building materials from a 120,000-sq-ft warehouse. The enterprise was financed with $100,000 in foundation grants and is now fully self-sustaining. The company trains workers for the city of Baltimore's workforce development program and guarantees full time employment for all successful trainees. Second Chance is a non-profit organization and thus private building owners can receive tax benefits for donating usable building materials.

F. Feedback at Public Forums

Franchising---Approximately 65% of Delawareans live in unincorporated areas of the states. The question of franchising recycling collection as has been introduced in Kent County is of concern; this issue was also raised during stakeholder meetings. ILSR added comments on franchising options under the Observations section, above.

Energy and Jobs Charts---Participants wanted more a more detailed breakdown of energy and pollution conserving and job potential for Delaware. BJ Vinton, Chair, Recycling Public Advisory Council suggested the following summaries for discussion:

Table 9: Total Net Program Value

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Total
Diversion Rate	25%	30%	35%	40%	45%	50%	
Value of Discards @50% Recovery	$19,983	$23,979	$27,976	$31,972	$35,969	$39,965	$179,843
Avoided Landfill Cost	$12,500,000	$15,000,000	$17,500,000	$20,000,000	$22,500,000	$25,000,000	$112,500,000
Cost of Recycling Fund	$(6,000,000)	$(6,000,000)	$(6,000,000)	$(6,000,000)	$(6,000,000)	$(6,000,000)	$(36,000,000)
Net Program Value	$6,519,983	$9,023,979	$11,527,976	$14,031,972	$16,535,969	$19,039,965	$76,679,843

Table 10: Additional Program Benefits

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Cumulative Total
Jobs Created	157	315	472	630	787	944	944
Reduced Emissions (MTCE)	56,360	67,632	78,904	90,176	101,448	112,720	507,240
Reduced Energy Consumption (Btu)	4,702,685	5,643,222	6,583,759	7,524,296	8,464,833	9,405,370	42,324,165

Table 11: Jobs and Energy Data

Categories	Tons/Year Generated	Projected Tons/Year Recovered	Potential Local "Process-ing" Jobs	Potential Regional Manufactur-ing Jobs	Total Potential Jobs @ 50% Recovery	Metric Tons of Carbon Equivalent / Ton	Total MTCE	Energy Savings per Ton of Recycled Material	Total BTU's Saved
1. Reuse	28,000	14,000	87	---	87	0	6,860	4	49,420
2. Paper	370,000	185,000	153	323	476	0	17,760	23	4,243,900
3. Plant Debris	100,000	50,000	20	---	20	0	2,500	(1)	(29,000)
4. Putrescibles	190,000	95,000	38	---	38	0	4,750	(1)	(55,100)
5. Wood	40,000	20,000	8	---	8	1	13,400	(1)	(14,500)
6. Ceramics	20,000	10,000	2	---	2	0	800	5	51,300
7. Soils	10,000	5,000	2	---	2	-	-	-	-
8. Metals	60,000	30,000	17	71	88	1	42,900	75	2,244,300
9. Glass	30,000	15,000	16	40	56	0	1,200	2	31,950
10. Polymers	110,000	55,000	114	512	625	0	22,550	52	2,883,100
11. Textiles	40,000	20,000	170	---	170	-	-	-	-
12. Chemicals	2,000	1,000	n/a	n/a	n/a	-	-	-	-
Total	1,000,000	500,000	628	945	1,574		112,720		9,405,370
					3148		225,440		18,810,740

Note: Figures represent one possible scenario and are based on job-to-ton ratios shown in previous table. Jobs for recovery of plant trimmings, putrescibles, wood, and soils are based on the composting job-to-ton ratio. Ceramics are assumed recovered as an aggregate at a construction and demolition recovery facility. For polymers, half the recovered tonnage is assumed processed at a conventional material recovery facility and the other half at a dedicated plastics processing facility. All energy and emissions data from Solid Waste Management and Greenhouse Gases: A Life-Cycle Assessment of Emissions and Sinks (EPA530-R-06-004)

ILSR staff will review these charts and respond to DNREC and the Recycling Public Advisory Council.

Education and Training----The discussion on the need for education and training focused on the amount of the budget raised from the surcharge to be spent on this category. Some participants felt that 25%, as proposed in the ILSR report, was too much. Participants eventually agreed that the 25% level was acceptable if the education and training program included additional aspects of training including industry workshops for leading companies in each sector, and non-formal training venues independent of colleges and universities. It was also noted that DSWA already initiated education programs throughout the state and that the DSWA staff should be informed as the DNREC grant program are prepared.

Emphasis on Economics and Markets---Participants praised the report for its focus on materials and market value of commodities. The surcharge program was seen as an investment not a tax. They approved of the sunset feature after 6 years; allowing Delawareans to reconsider the surcharge and mandatory recycling after being informed by years of activity in recycling and composting. Citizens of Rehoboth Beach pointed out that over one-half of 1500 households in the city immediately signed up for curbside collection under the arrangement between the city and DSWA. The city needs time to digest this program and see how many more families would sign up before future planning would be meaningful. The participant also pointed out that grants in the past from DNREC helped establish a beach recycling program. With additional grant program funds, such a program could be re-implemented on a permanent basis. Other participants pointed out that DNREC grant funds also initiated recycling projects in Wilmington and New Castle County.

Participants felt the report supported small haulers in Delaware. The loyalty between haulers and customers was emphasized.

Mandatory Recycling----Participants agreed with the consensus found among stakeholders that mandatory recycling was preferred by politically difficult to achieve. One participant pointed out that a mandatory recycling bill was introduced in the legislature. Participants felt that over time, successful recycling and composting programs would convince elected officials that mandatory separation was needed and cost effective. Participants also pointed out that ILSR's recommended $6 per ton surcharge was twice the surcharge amount in a current bill before the legislature.

ILSR's surcharge program would cost $.76 per household per month as compared to $.38 per household per month for a $3 per ton surcharge.

ILSR discussed its decision to reduce the recommended surcharge from $12 per ton to $6 per ton, as had been suggested in earlier drafts of the report. ILSR explained that since the $12 per ton estimate was made, developments in the state made it clear that public and private dollars were already starting to be invested in the state. These included the decision by the City of Wilmington to expend the pilot curbside program with Recycling Bank/Blue Mountain Recycling for citywide application. The DSWA initiated arrangements with other Delaware cities to provide curbside collection. Private corporations have made significant investment for processing organic materials and construction and demolition materials for composting and recycling.